

# SuperNutrition's Fact vs Fiction

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## WHY FACT VS FICTION?

We are frequently asked why we use or do not use certain ingredients or forms of nutrients in our multi-vitamin formulas.

Fact Vs Fiction provides information on how we choose specific forms of nutrients.

Scientific references are cited and text from abstracts is included to provide research details.

We evaluate nutritional ingredients by the following criteria:

- 1) Is it natural and normal to the human body?
- 2) Has it had a long history of safe use in humans?
- 3) Is it supported by science and/or traditional herbal wisdom?
- 4) Is it nutritionally effective?
- 5) Is it cost-effective for our customers?
- 6) Is it concentrated enough that we can provide optimal levels to our customers in a reasonable amount of tablets?

We have no vested interest in any form of nutrient. Our selections are based on what is best for our customers' health and their pocketbook.

## The Truth About

# Vitamin & Mineral Doses: Safety & Effectiveness

**Fiction:** High doses of vitamins and minerals are toxic.

**Fact:** The newly discovered more nutritionally effective doses of vitamins and minerals are often significantly higher than US Government assigned Daily Values.

The safety of these higher doses is confirmed by conservative medical, scientific and government organizations. See Vitamin Safety Table on page 6.

**Fiction:** Small doses of vitamins and minerals, such as Daily Value level multi-vitamins and "food-grown-type" nutrients are as effective as higher doses of USP-type nutrients.

**Fact:** Specific health benefits derived from higher doses of vitamins and minerals have not been duplicated using RDA levels or "food-grown-type" levels of vitamins and minerals.

In some scientific studies, only higher doses have been shown to deliver these health benefits.

## INSIDE

- Complete Vitamin Safety Table
- Optimum Doses

Some of our customers ask about whether higher doses of vitamins and minerals are no more effective than Daily Value (DV or RDA) levels, and that higher doses may be toxic. This Fact vs Fiction report examines both these questions in the light of scientific research about vitamin and mineral dosages, and their effectiveness at optimum doses that are safe.

## Dosing and Effectiveness

All available published scientific studies show that if you eat the average American diet that provides approximately 600 mg of food calcium per day, low doses, such as 100 mg per day of supplemental calcium, no matter what type or form of calcium is considered, are not effective for important health applications, such as building bone.

For instance, one three-year placebo-controlled study of senior women showed that while a typical daily intake of calcium from food (683 mg average per day) allowed 3% bone loss in a dose-dependent manner, 1,000 mg of supplemental calcium carbonate added to the 683 mg of dietary calcium, totaling 1,683 mg of daily calcium, improved spinal bone density (3.7%) and hip bone density (3%).

*Storm D, et al. Calcium supplementation prevents seasonal bone loss and changes in biochemical markers of bone turnover in elderly New England women: a randomized placebo-controlled trial. Clin Endocrinol Metab, 83(11):3817-25 1998) (Fact Vs Fiction #2, Calcium, p 8.)*

Low supplemental doses of any type of calcium (calcium carbonate, calcium citrate, calcium gluconate, or “food-grown-type” calcium) have not been shown to protect bone density. All independent published scientific studies conclusively agree that approximately 1,000 mg of supplemental elemental calcium per day, from any source, is required for bone health and bone maintenance in American adults who consume the average American diet, and more is required by seniors, 65 years or older. (1,300 mg to 1,700 mg of supplemental calcium, according to a study by Heaney, et al. 2001. See page 12 of Fact Versus Fiction on Calcium.)

While studies show that calcium carbonate, citrate and other types of calcium can improve bone density at doses of 1,000 mg per day added to dietary calcium, there are no published studies at any dose that examine “food-grown-type” calcium’s effect on bone density, although it is likely that “food-grown-type” calcium would produce similar benefits at a similar 1,000 mg amount.

## Studies Showing Higher Doses Are Required To Support Optimum Long-Term Health

There are over 20,000 studies in the National Library of Medicine showing health benefits of vitamins and minerals at much higher than Daily Value (RDA) levels. Below are a few examples.

### **Vitamin B6 – Higher Doses Reduce PMS Symptoms While Not Low Doses Did Not**

A study of 630 women showed that while 40 mg of Vitamin B6 produced no significant benefit, 100 mg to 150 mg reduced PMS symptoms in about 66% of the women, while 160 mg to 200 mg of Vitamin B6 reduced PMS symptoms in about 79% of the women.

*Brush MG, et al. Pyridoxine in the treatment of premenstrual syndrome: a retrospective survey in 630 patients. Brit J Clin Pract 1988;142(11):448-4562.) Consult your doctor about the use of higher dose Vitamin B6 for PMS.*

### **Vitamin B6 – Fewer Kidney Stones**

In a study of 121,701 females (Curhan, 1999) who took between 10 and 500 mg of Vitamin B6 per day, higher doses were shown to be associated with fewer kidney stones. For instance, a 21% decrease in stone formation was seen in healthy women who took 200 mg per day.

*Edwards P, et al. Effects of oral pyridoxine upon plasma and 24-hour urinary oxalate levels in normal subjects and stone formers with idiopathic hypercalciuria. Urol Res. 18:393-396, 1990.*

### **Vitamin E – Lower Doses Do Not Reduce Cholesterol Oxidation – Higher Doses Do**

The Daily Value for Vitamin E is currently 30 IU. A placebo-controlled study showed that Vitamin E dosing of 60 IU or 200 IU had no effect on reducing the oxidation of LDL cholesterol that precedes cholesterol plaque formation in arteries, but that doses of 400 IU, 800 IU and 1,200 IU had a significant effect on safely reducing the oxidization of LDL cholesterol in the blood stream.

*Jialal I, et al. The effect of alpha-tocopherol supplementation on LDL oxidation. A dose-response study. Arterioscler Thromb Vasc Biol 1995;15(2):190-198.*

### **Multi-Vitamins – 10 Times RDA Improves Mood, Sleep, Reaction Times**

A double-blind, placebo-controlled study of 129 students over one year showed that those who took a multivitamin with 10 times the RDA of Vitamins B-1, B2, B3, B6, B12, Biotin, Vitamin C and Vitamin E, had better reaction times, better mood, more restful sleep, and described themselves as more agreeable and better composed.

*Benton D, et al. Vitamin supplementation for 1 year improves mood. Neuropsychobiology (Switzerland), 1995, 32(2) p98-105.*

### **High Dose Vitamin Therapies – May Help Protect Against 50 Genetic Diseases**

Noted nutrient researcher and one of the world's most respected cell biologists, Bruce Ames, PhD, of UC California at Berkeley, published a study that stated that high dose vitamin therapies may help treat many genetic defects. His conclusion stated, "High dose vitamin therapies have been efficacious in ameliorating about 50 genetic diseases..." These diseases included heart disease, cancer, Alzheimer's, migraines and alcohol tolerance.

*Ames BN, et al. High dose vitamin therapy stimulates variant enzymes with decreased coenzyme binding affinity (increased Km): relevance to genetic disease and polymorphisms. Am J Clin Nutri, 2002;75:616-658.*

### **Calcium – Better Baby's Bones**

While a calcium dose of 1,000 mg or more is important for bone health for senior women, a double-blind peer-reviewed study of 256 prenatal women showed that if the women ate an average American diet that provided less than 600 mg of calcium per day, when they took 1,200 mg or more of calcium carbonate per day their baby's were born with bones that were 15 percent more dense than those women who took less calcium. This study showed no adverse effect on their baby's bones, even when mother's consumed 3,000 mg of supplemental calcium carbonate per day.

*Koo WW, et al. Maternal calcium supplementation and fetal bone mineralization. Obstet Gynecol 1999 Oct;94(4):577-582.*

### **Vitamin C – Higher Doses Maintain Bone Density Better Than Lower Doses**

The Daily Value for Vitamin C is currently 60 mg. Studies on Vitamin C show that doses of Vitamin C that have the potential to optimize various components of overall health, like bone density, begin at about 1,000 mg per day. One peer-reviewed study showed that senior women

who took supplements that contained between 1,000 mg and 5,000 mg of Vitamin C per day had 5% greater bone density than women who took 500 mg or less per day over three years.

*Morton DJ, et al. Vitamin C supplement use and bone mineral density in postmenopausal women. J Bone Min Res 2001;16(1):135-140.*

### **Vitamin C – Higher Doses Reduce Duration of Colds - Lower Doses Have No Effect**

Another peer-reviewed study stated that Vitamin C doses of 250 mg to 500 mg per day produced no effect on reduction of cold symptoms, while doses from 1,000 mg to 6,000 mg per day decreased cold durations an average of 21%.

*Hemila H, et al. Vitamin C and the common cold: a retrospective analysis of Chalmers' review. J Am Coll Nutr 1995;14(2):116-123.*

### **Vitamin C – Increased Human Lifespans**

One of the first human studies that demonstrated increased human lifespans, showed that men who took 800 mg per day of Vitamin C lived six years longer than men who consumed the 60 mg per day that is the Daily Value.

*Enstron, et al. Vitamin C intake and mortality among a sample of the United States population. Epidemiology 1992 May;3(3):194-202.*

### **Vitamin C: What Is A Natural Daily Intake?**

#### **A Natural Foraging Diet Provides About 2300 MG Per Day**

Are the Vitamin C doses cited in the studies above high? No, in fact research shows that doses of Vitamin C in the thousands of milligrams are what a truly natural diet would provide. Maybe this is why the doses in the studies above were shown to be more effective than lower doses that are far below the amount of Vitamin C that can be found in a truly natural foraging diet.

In investigating how much Vitamin C a truly natural foraging diet might provide, I called the Linus Pauling Institute and spoke with their administrative officer Steve Lawson, who wrote an article called *The Optimal Intake of Vitamin C*, seen on their web site at: <http://osu.orst.edu/dept/lpi/sp-su97/intake.html>. He told me that the Institute had reduced their official recommendation for Vitamin C supplementation several years ago to 200 mg per day plus what you get from a healthy diet, which he said can amount to another 2,000 or more mg if you eat 2,500 calories of raw plant foods per day. The following was excerpted from the article on their web site.

### **Evolutionary Evidence For Optimal Vitamin C Dosing**

Nobel Prize winner Linus Pauling based his own intake of vitamin C on several factors, including the amount synthesized by animals that are able to do so, the amount consumed in the diet by wild animals that are biologically closely related to humans, and the estimated intake by our Paleolithic ancestors. In *How to Live Longer and Feel Better*, he reasoned that animals capable of the endogenous synthesis of vitamin C would not manufacture so much if it were not beneficial. For example, goats weighing about 50 kilograms, or 110 pounds, synthesize over 9,000 milligrams (9 grams) of vitamin C per day, or 13,000 mg/day per 70 kilograms (154 lbs) of body weight. The laboratory rat weighs about 325 grams and synthesizes 20 to 70 mg/day, or 4,000 to 15,000 mg/day per 70 kilograms of body weight. The optimal intake of vitamin C for guinea pigs, weighing about 700 grams and unable to synthesize vitamin C, was reported by Yew in 1973 to be about 35 mg/day, or 3,500 mg/day per 70 kilograms of body weight. Chimpanzees in captivity weigh about 55 kilograms and consume about 800 to 1,600 mg/day of vitamin C in their prepared diets; gorillas, weighing about 200 kilograms, ingest between 3,000 and 6,000 mg/day. These primates, our closest biological relatives, are not able to synthesize vitamin C and must depend upon dietary sources to prevent scurvy and optimize performance

and health. In 1949, Dr. G.H. Bourne calculated that gorillas in the wild consume about 4,500 mg/day of vitamin C.

In *Evolution and the Need for Ascorbic Acid* (published in the Proceedings of the National Academy of Sciences in 1970), Linus Pauling calculated the amount of several vitamins in 110 raw plant foods, based on the amount of each plant food that provides 2,500 kcal of energy, which is the average daily need for humans. The average amount of vitamin C for the 110 plant foods providing 2,500 kcal of energy is 2,300 mg, or 38 times the present RDA. (Of course, the value for vitamin C would decrease somewhat if meat, poultry, or fish were included in the diet to provide food energy or if the consumption of nuts or grains is high.)

Dr. Albert Szent-Gyorgyi, 1937 Nobel laureate in Physiology or Medicine for discoveries of biological oxidation processes, confided to Linus Pauling in 1966 that he took about 1,000 mg/day of supplemental vitamin C as ascorbic acid. Dr. Pauling himself took much larger doses. Both Szent-Gyorgyi and Pauling recognized the importance of supplemental vitamins many decades ago. In 1938, Linus Pauling said that investigation of substances manufactured in the body or ingested in food would have "transcendent significance to mankind," and in 1939, Szent-Gyorgyi wrote, "Vitamins, if properly understood and applied, will help us to reduce human suffering to an extent which the most fantastic mind would fail to imagine."

## The Differences Between Daily Value (RDA's), Safety (No or Lowest Observed Adverse Effects Level) And Minimum Toxic Dose

We have received questions about Daily Value levels of vitamins and essential minerals. What levels are safe and what are toxic doses of vitamins and essential minerals. Below is an explanation of the various levels of dosages of vitamins and essential minerals.

**Level 1: *Daily Value (DV) formerly called Recommended Daily Allowances (RDA)*.** This is usually the dosage that has been determined to be enough of a given nutrient to keep people from experiencing "classic" nutrient deficiency diseases, like rickets (Vitamin B1 deficiency), pellagra (Vitamin B3 deficiency) or scurvy (Vitamin C deficiency). There is a growing concern in the scientific community, based on the most current studies, including some sponsored by the US Government's Department of Agriculture, that the DV/RDA doses for some nutrients may not be high enough to support optimum health or long-term well-being.

**Level 2: *The low-to-moderate dose ranges*** (somewhat above the DV/RDA's) that are in most vitamin formulas

**Level 3: *The optimal health and anti-aging dose ranges*.** (These are in the high moderate ranges, such as the dose ranges SuperNutrition uses to slow accelerated or premature aging.)

**Level 4: *No Observed Adverse Effect Level (NOAEL)*** This dosage is safe enough that no observed adverse effect has been seen at this dose when taken over long periods of time. According to the Institute of Medicine, this dosage level "*requires no application of a safety factor to determine a safe intake, based on the most sensitive subgroup.*" The NOAEL is determined to be safe by in-depth conservative analysis of all available scientific databases from around the world for many years.

**Level 5: *Lowest Adverse Effect Level (LOAEL)*** This is a dosage where toxicity has rarely occurred, and then only for some people with unusual sensitivities, who are considered to be in

“sensitive subgroups.” This is rare. This dosage may be safe for most people, but “*may require the application of a safety factor to calculate a safe intake.*” “*Application of a safety factor*” means that groups that are sensitive, such as people who have unusual vitamin or mineral storage problems, may have side effects or a toxic response that most other people might not have at this dose. (Example: 1 in about 300 people have iron storage problems.<sup>1</sup>)

**Level 6: *Minimum Toxic Dose (MTD)*** Pharmacy Times, in their 1985 Vitamin Safety Index, listed MTD’s as the lowest estimated dose that might cause a toxic effect. As you will see in the Vitamin and Essential Mineral Safety Table, the MTD’s for all vitamins and minerals (except Vitamin A and niacin) are 4-20 times higher than the No Observed Adverse Effect Level (NOAEL). This is an extremely conservative estimate in the case of some nutrients, such as occurred with the calculation for Vitamin C. In the period of time after 1985, comprehensive analysis has shown that some of these estimated dosages are probably too low. We include the *Pharmacy Times* information in the interest of full disclosure of very conservative suggestions.

**There is no solid scientific reason for an LOAEL (or NOAEL) for Vitamin C.**

The National Academy of Sciences established a NOAEL for Vitamin C June, 2000, because they were directed to establish one. They could not find support for any toxic dose for Vitamin C, so they arbitrarily placed an NOAEL with no solid data to validate it.

The above statement regarding “*no solid data to validate it*” is supported by a study sponsored by the U.S. Government Institute of Medicine-sponsored Food and Nutrition Board.

*Johnston CS. Biomarkers for establishing a tolerable upper intake level for vitamin C. Nutr Rev 1999 Mar;57(3):71-77.*

Dietary reference intakes (DRIs) for vitamin C for healthy U.S. populations are currently being formulated by the Panel on Dietary Antioxidants and Related Compounds of the Food and Nutrition Board of the Institute of Medicine. A major task of the Panel is to analyze the evidence of adverse effects of high-dose vitamin C intakes to derive, if appropriate, a Tolerable Upper Intake Level (UL) for vitamin C. The present report details current and past research examining potential adverse effects of supplemental vitamin C. The available data indicate that very high intakes of vitamin C (2-4 g/day) are well tolerated biologically in healthy mammalian systems. *Currently, strong scientific evidence to define and defend a UL for vitamin C is not available.*

Dr. Johnston said that there is no “*strong scientific evidence*” to defend a position for a “*tolerable upper limit*” (UL) for Vitamin C --- because Vitamin C has not been shown to cause toxicity to cells in the body, even at very high doses. (Note: UL equals the Tolerable Upper Limit, which is generally in the same dosage range as the NOAEL.) She also noted that 2000 to 4000 mg was a daily dose that may be optimal for humans, based on her review of the scientific literature.

## **The Vitamin and Essential Mineral Safety Table**

The Vitamin and Essential Mineral Safety Table on the next page shows the DV, NOAEL, LOAEL and MTD dosage levels for each vitamin and essential mineral. The table was compiled using data from *The US Government Institute of Medicine’s Food and Nutrition Board*, the *Council For Responsible Nutrition’s* dosages (we provide whichever is most current), and *Pharmacy Times* Minimum Toxic Dose (MTD) information. The *Pharmacy Times* information is dated 1985. We could find no updated information on a current calculation of the MTD from *Pharmacy Times*, so the 1985 MTD’s are included here only as very conservative references.

**SUPERNUTRITION VITAMIN AND MINERAL SAFETY TABLE**  
**Vitamin and Mineral Doses And Safety For Most Adults**

<b>NUTRIENT</b>		Daily Value US Gov't Minimum Level For Health	SuperNutrition Adult Multivitamin Ranges	LOAEL CRN or Inst/Med Lowest Observed Adverse Effect Level	MTD Pharmacy Times First Signs Of Toxicity
Vitamin A	IU	3,000	3,000 to 5,000	21,600	25,000 – 50,000
Vitamin C	MG	60	150 to 1,500	None	2,000 – 5,000
Vitamin D	IU	400	700 to 1,000	3,800 (Inst Med)	50,000
Vitamin E	IU	30	120 to 800	None established	1,200
Vitamin K	MCG	80	80	None established	None given
Thiamine (Vit. B1)	MG	1.5	40 to 150	None established	300
Riboflavin (B2)	MG	1.7	30 to 100	None established	1,000
Niacin (B3) SR = Slow Release	MG	20	40 to 300	1,000 500 SR	1,000
Niacinamide (B3)	MG	20	20 to 60	3,000	None given
Pyridoxine (B6)	MG	2	35 to 250	500	2,000
Folic acid	MCG	400	1,000	None established	400,000
Vitamin (B12)	MCG	6	150 to 1,000	None established	None given
Biotin	MCG	300	325 to 600	None established	50,000
Pantothenic acid (B5)	MG	10	35 to 3000	None established	10,000
Beta-carotene	IU	None	7,500 to 15,000	None established	None given
Calcium	MG	1,200	100 to 1,500	5,000 (Inst Med)	12,000
Magnesium	MG	400	50 to 700	None established	6,000
Iron	MCG	18	6 to 40	100	100
Iodine	MG	150	225	None established	2000
Zinc	MG	15	15 to 30	60 mg	500
Selenium	MCG	70	200 to 250	910	1,000
Copper	MG	2	2	None established	100
Manganese	MG	2	5 to 10	None established	None given
Chromium (III)	MCG	120	30 to 300	None established	None given
Molybdenum	MCG	75	50 to 150	None established	None given

**DV (Daily Value):** Previously was Recommended Daily Allowance. These dosages are estimates of the minimum amount necessary for good health as determined by the National Academy of Sciences, acting for the U.S. Government. New nutritional research is leading some researchers and clinicians to estimate that these doses may not be high enough to support optimal health in today's stressful world.

**LOAEL:** Meaning the "Lowest Observed Adverse Effect Level." These dosages were determined by The Institute of Medicine or CRN to be safe for almost everyone, but "may require the application of a safety factor to calculate safe intake" for people with unusual vitamin or mineral sensitivities.

**MTD's:** Meaning the "Minimum Toxic Dose." These dosage levels were published in *Pharmacy Times Vitamin Safety Index*, May, 1985, as very conservative estimates of the minimum doses that may cause toxic effects (side effects).

**SuperNutrition Vitamin Potencies Are Completely Safe**

As can be seen from the table, the levels of vitamins and minerals found in SuperNutrition multivitamins are not in the adverse effects or toxic ranges. They are far lower than doses that have the potential to be produce adverse effects.

**All Vitamins Are Safer Than OTC Dugs and Prescription Drugs**

The U.S. Government Centers for Poison Control's first 10-year report showed no deaths from vitamins, 60 deaths from accidental iron poisoning, 2556 deaths from OTC drugs like aspirin, and over 1,000,000 deaths from prescription drugs.

**Notes for the chart:**

- In the column for LOAEL that says "none" (*none established*), it means that the National Academy of Sciences (NAS) has not determined a conclusive *Lowest Observed Adverse Effect Level* dose that may be unsafe for some "sensitive subgroups," either because there is none or because they do not have enough reports of toxic effects to establish one. For many vitamins, there simply are no reports or too few reports of adverse effects at any level and, therefore, no LOAEL number can be identified.

- The current NOAEL for Vitamin D is 2,400 IU, according to the Institute of Medicine's Food and Nutrition Board. This is known to "cause no known risk." We are now including 1,000 IU of Vitamin D in most of our nutrient formulas for adults. The Food and Nutrition Board has conservatively placed the current LOAEL for Vitamin D at 3,800 IU.

- B-Vitamins, except B3 and B6, have either no potential or very little potential for toxicity. Some do not have LOAEL's because of their low potential for toxicity. The National Academy of Sciences reports no evidence of toxicity for oral doses of B1, B2 and B12, and no reports of toxicity for folic acid at 15,000 mcg, and biotin at 10,000 mcg.

- MTD's for B-vitamins are very high, in general. Any discussion of toxicity should include the MTD's. Vitamin E's MTD of 1,200 IU is extremely conservative. One study found 1,200 IU of Vitamin E produced a better effect than lower doses at reducing LDL cholesterol oxidation, which precedes artery plaque formation, with no toxicity. (Fuller CJ, et al. Effects of increasing doses of alpha-tocopherol in providing protection of low-density lipoprotein from oxidation. Am J Cardiol 1998 Jan 15;81(2):231-233.)

- Dr. Reinholdt Vieth, has confirmed that there has been no recorded Vitamin D toxicity (with hypercalcemia) at doses less than 40,000 IU per day. (Vieth R. Vitamin D supplementation, 25-hydroxyvitamin D concentrations, and safety. Am J Clin Nutr, 69(5):842- 56 1999 May.)

Dr. Vieth has also published a study that indicated that 4,000 IU of Vitamin D is safe for the general public. This requires further investigation. (Vieth R, et al. Efficacy and safety of vitamin D3 intake exceeding the lowest observed adverse effect level. Am J Clin Nutr (United States), Feb 2001, 73(2):288-294.)

SuperNutrition doses are in the same range or below the ranges that are known to have NO potential for toxicity. These are in the optimal dose ranges, based on published scientific research.

This document is for educational purposes only. It has not been evaluated by the Food and Drug Administration. It is not intended to diagnose, treat, cure, or prevent any disease. It is not meant to substitute for the advice of a qualified health care professional.

## **Other Fact vs Fiction Reports**

**#1: Copper Sulfate**

**#2: Calcium Carbonate, Calcium Citrate,  
and “Food-Grown-Type” Calcium**

**#3: Saw Palmetto**

**#4: “Food-Grown-Type” Nutrients vs USP nutrients**

**#5: Vitamin & Mineral Doses: Safety and Effectiveness**

**#6: Vitamin A (Retinol) and Beta Carotene**

**#7: Selenite, Selenomethionine, and “Food-Grown-Type”  
Selenium**

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